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ABSTRACT

Television teaches children gender-specific behaviors, attitudes, characteristics, and personality traits. Research indicates that by observing male and female characters on television, children learn to label certain characteristics and behaviors as masculine or feminine and to assign traditional sex-role stereotypes to careers. Content studies of televised portrayals of professional women reveal a long history of under-representing and stereotyping women. A study examined televised portrayals of female characters on five episodes of each of four children's educational science programs ("Mr. Wizard's World," "Beakman's World," "Bill Nye the Science Guy," and "Newton's Apple"). Results indicated that children's educational science programming represented three times as many male as female characters, and twice as many adult male scientists as adult female scientists. Female characters were portrayed as pupils or apprentices, laboratory assistants, science reporters, and expert scientists. However, of the 82 female characters observed, 69 female characters were portrayed in secondary roles as students, laboratory assistants and science writers. Noticeably few adult female characters were portrayed as expert scientists or in positions of high prestige within the scientific community. (Contains 47 references and one table of data.) (Author/RS)

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A Lab of Her Own?: Portrayals of Female Characters on Children's Educational Science Programs

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Abstract

A Lab of Her Own
Portrayals of Female Characters on
Children's Educational Science Programs

Television teaches children gender-specific behaviors, attitudes, characteristics, and personality traits. Research indicates that by observing male and female characters on television, children learn to label certain characteristics and behaviors as masculine or feminine and to assign traditional sex-role stereotypes to careers. Content studies of televised portrayals of professional women reveal a long history of under representing and stereotyping women.

This study found that children's educational science programming presented three times as many male characters as female characters, and twice as many adult male scientists as adult female scientists. Female characters were portrayed as pupils or apprentices, laboratory assistants, science reporters, and expert scientists. However, of the 82 female characters observed, 69 female characters were portrayed in secondary roles as students, laboratory assistants and science writers. Noticeably few adult female characters were portrayed as expert scientists or in positions of high prestige within the scientific community.

A Lab of Her Own?:
Portrayals of Female Characters on
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Introduction

Television teaches children gender-specific behaviors, attitudes, characteristics, and personality traits. By observing characters on television, children learn to label certain characteristics and behaviors as masculine or feminine (Dohrmann, 1975; Miller and Reeves, 1976; Signorielli and Lears, 1992) and to assign traditional sex-role stereotypes to careers (Beuf, 1974; Freuh and McGhee, 1975). Historically, televised portrayals of professional women have been limited and stereotyped (Long and Simon, 1974; Levinson, 1975; Mayes and Valentine, 1975; Miller and Reeves, 1976; Matelski, 1985; Lovdal, 1989; Signorielli, 1989); however, more accurate representations of professional women have recently appeared on prime-time programming (Haskell, 1979; Reep and Dambrot, 1987). This study explores whether children's educational science programming is also providing more accurate portrayals of working women to serve as role models for young female viewers.

One occupation from which women have long been excluded is science (Rossiter, 1982). Concerns have been raised about the underrepresentation of women in scientific professions. Women represent only 32.6 percent of all graduate students in the sciences and engineering (National Science Foundation, 1993) and only 16.4 percent of employed scientists and engineers (National Science Foundation, 1990).

The many factors that can contribute to girls' lack of interest in science have been well-documented. These factors include preferential treatment of boys in science classrooms (Kahle and Lakes, 1983; Jones and Wheatley, 1990); teaching approaches and assignments that favor male intellectual styles (Skolnick et al., 1982; Shemesh, 1990; Lock, 1992); an absence of female role models in the classroom (Van Fossen, 1977); and gender bias in science textbooks (Taylor, 1979; Bazler and Simonis, 1991; Potter and Rosser, 1992). In addition, girls' negative attitudes toward science, scientists, and extracurricular science activities (Vockell and Lobonc, 1981; Mason, 1988; Wareing, 1990); unsupportive family, teachers, and advisers (Bruer, 1984; Ivey, 1987; Bar-Haim and Wilkes, 1988); and limited exposure to female role models (Ivey, 1987) can contribute to girls' lack of interest in science. Only a few studies have looked at ways cultural factors, like televised images of female scientists, can affect girls interest in science (LaFollette, 1981).

According to social learning theory, televised images of men and women can influence children's attitudes and social behaviors (Bandura, 1986). A number of researchers have shown that television contributes to children's conceptions of sex-roles, including their perceptions of occupational roles (Beuf, 1974; Freuh and McGhee, 1975; Miller and Reeves, 1976; Mayes and Valentine, 1979; Kimball, 1986; Morgan, 1987; Wroblewski and Huston, 1987; Lovdal, 1989; Signorielli and Lears, 1992). For example, one study showed that girls were more likely to downplay their career aspirations after viewing stereotypical images of

women in traditionally female roles on television (Geis, 1984). In addition, television has been found to be a more powerful source of occupational status knowledge for children than interpersonal sources (DeFleur and DeFleur, 1967).

This research provides a descriptive analysis of the portrayal of female characters on children's educational science programs. A description of the televised images that children see is necessary before assessing the impact of these images on children. An analysis of these images also helps determine whether efforts are being made to present positive female role models. This analysis addresses the following questions: Are female characters equally represented? Are female scientists equally represented? How are female characters portrayed?

Portrayals of Professional Women on Television

Content studies of television programming and advertising reveal a history of the underrepresentation of women in news programs (Rakow and Kranich, 1991), commercials (Courtney and Whipple, 1974; Riffe et al., 1989; Welch et al., 1979), prime-time programs (Signorielli, 1989; Davis, 1990), public television programs (Dohrmann, 1975; Matelski, 1985), children's cartoon programs (Levinson, 1975; Mayes and Valentine, 1979; Signorielli, 1991), children and family-oriented programs (Long and Simon, 1974), children's educational programs (Dohrmann, 1975), and children's science programs (LaFollette, 1981).

The absence of women on television sends negative messages to young female viewers about the role of women in society. Tuchman

(1981) writes that "television proclaims that women don't count for much" (p. 170). She explains the effects of this "symbolic annihilation" of women:

> What can the pre-school girl, the school-girl, the adolescent female and the woman learn about a woman's role by watching television? The answer is simple. Women are not important in American society, except **perhaps** within the home (Tuchman, 1981).

On television, women are most often shown working in the home. Images of housewives pervade television commercials (Dominick and Rauch, 1972; O'Donnell and O'Donnell, 1976; Ferrante et al., 1988; Lovdal, 1989) and programming (Long and Simon, 1974; Signorielli, 1989). Less than a third of the married women on television have jobs outside of the home (Signorielli, 1989).

When women are shown working outside of the home, they are often portrayed a limited number of occupational roles on television. In addition, women are often shown in positions of low prestige (Courtney and Whipple, 1974; Miller and Reeves, 1976; Matelski, 1985; Lovdal, 1989). Women are rarely cast in prestigious professions such as lawyers, doctors, business executives, scientists, engineers, athletes, professors, and judges (Dominick and Rauch, 1972). Instead women are frequently cast in traditionally female occupations such as secretaries, teachers, entertainers, maids, waitresses, and nurses (Long and Simon, 1974; Levison, 1975). These portrayals of working women have changed little over the past 40 years (Vande Berg and Streckfuss, 1992).

These stereotypical depictions of women send discouraging messages to young viewers about the role of women in the workplace.

Beuf (1974) explains that "the more children see of the world, as it is presented by everyday cultural purveyors, the more likely they are to apply sex stereotypes to careers" (p. 144).

Methods

To examine televised portrayals of female characters on children's educational science programs, we selected five episodes from each of the following 30-minute, nonanimated programs: "Mr. Wizard's World," "Beakman's World," "Bill Nye The Science Guy," and "Newton's Apple." These episodes aired between February and August 1994. To ensure that the episodes chosen were representative, we viewed several episodes of the shows.

"Mr. Wizard's World" explores science by focusing on children's visits to Mr. Wizard's house where they help him conduct various science demonstrations. "Beakman's World" answers viewers' questions during a fast-paced, colorful, humorous program featuring science demonstrations conducted by Beakman and his assistants, Josie or Liza, and Lester Ratman (a man dressed in a rat costume). "Bill Nye the Science Guy" examines a different topic each week as Bill Nye, a cast of children, celebrity guests, adult actors, and guest scientists explain science during on-location interviews with scientists, music videos, and demonstrations in Nye Labs. "Newton's Apple," answers viewers' questions as Host David Heil, Field Reporter Peggy Knapp, and Naturalist Nancy Gibson conduct and observe scientific demonstrations, and visit with scientists from around the world.

These children's programs were selected for an in-depth analysis because they are educational science programs that regularly feature scientists. Other children's programs were not selected because they do not address scientific topics and feature scientists on a regular basis.

The analysis of the selected episodes covered the following three categories:

Frequency of Female Characters:
The number of different females appearing during each episode. This category included the number of adult and child/teen characters per episode. Characters under the age of 20 were counted in the child/teen category.

Frequency of Adult Female Expert Scientists:
The number of different females appearing as expert scientists on each episode. For this category, expert scientists were defined as those dressed in scientific attire, shown working with scientific equipment and materials, identified by a title that indicated an affiliation with the scientific community, or described as a researcher or scientist. Children who conducted or assisted with science experiments were not identified as adult expert scientists.

Portrayals of Female Characters:
For this category, the activities, conversations, and interactions of the female characters with the other actors in the program were analyzed. These portrayals were analyzed for evidence of gender role stereotyping. For example, were the female characters portrayed as vocal or silent? Competent or incompetent? Knowledgeable or uninformed? Professional or unprofessional? Confident or insecure?

The number of male characters and the number of male scientists in each episode also were counted to compare with those for female characters.

Findings

Frequency of Female Characters

In the episodes analyzed, 216 characters appeared; 82 (38

percent) were female and 134 (62 percent) were male. A total of 117 adult characters appeared on these programs; 30 were female and 87 were male. Adult male characters appeared almost three times as often as adult female characters.

Female and male children/teens were more equally represented. A total of 99 children/teens appeared on these programs; 52 (52 percent) were female and 47 (47 percent) were male. (See Table 1 for the total numbers for each program).

Frequency of Adult Female Expert Scientists

A total of 34 scientists were shown on these programs; 12 were female (35 percent) and 22 (65 percent) were male. Nearly, twice as many male expert scientists as female expert scientists appeared on these programs. (See Table 1 for the total numbers for each program).

Portrayals of Female Characters

The television programs presented varied portrayals of female characters. Female characters were portrayed as pupils, laboratory assistants, science reporters, and expert scientists. Each of these portrayals is discussed in the following sections.

Females as Pupils and Apprentices

The portrayal of females as students appears most frequently in "Mr. Wizard's World." An average of three different 10- to 12-year-old girls appear in each episode to assist Mr. Wizard with scientific demonstrations. While helping with these demonstrations, the girls nod in agreement as Mr. Wizard explains scientific processes and phenomena and periodically express their

amazement and wonder. During one demonstration, for example, a girl repeatedly says, "Oh, ok," "Hmmmhmmm," "Oh neat," and "Uhhuh."

Unlike the boys on the show, the girls on "Mr. Wizard's World" are often portrayed as being uncertain or incorrect during the demonstrations. Many of them respond tentatively to Mr. Wizard's questions: "It might freeze," "I don't know," "I think it's going to get colder," "Is that the right answer?" In response, Mr. Wizard either corrects them ("You mean the magnifying glass"), tells them to think ("Well, now think"), or launches into a brief science lecture ("When you make measurements like this, as scientifically as you can, you have to do the same as scientists do. You have to be very accurate in figuring your angles and measuring your distances"). The 10- to 12-year-old boys on the program also are portrayed as students and also assist Mr. Wizard; however, they are shown as more vocal, appear much more self-confident, and provide more explanations during the demonstrations.

On "Bill Nye the Science Guy," girls also are portrayed as young science apprentices. On this program, girls frequently are shown conducting scientific demonstrations and explaining scientific phenomena on their own, in addition to assisting Bill Nye with science experiments. The girls on this program appear much more confident, knowledgeable, competent, vocal, and self-assured than the girls on "Mr. Wizard's World."

For example, in one episode, a girl is seated across from a boy in the library. He tells her that his foot is asleep, and she confidently replies:

> Then uncross your leg. Your feet fall asleep when your blood and nerves get squeezed. This can happen when you sit cross legged for a really long time or your foot is in just some weird position. The same thing can happen to your arms, especially when you sleep funny. So keep your feet on the ground.

Later in the same episode this girl explains why the boy feels dizzy after spinning around the room. Again, her response reflects her knowledge and competence. The boy tells her, "You should be a doctor." She crosses her arms across her chest and replies, "Yeah, I know."

The young female pupils shown on "Bill Nye the Science Guy" and "Mr. Wizard's World" represent a variety of ethnic backgrounds. The other programs do not show as many females from diverse ethnic backgrounds.

Females as Laboratory Assistants

The female characters on the children's educational science programs were more likely than male characters to be portrayed as laboratory assistants. However, unlike the characters portrayed as female students, the female lab assistants did have more autonomy and are more often shown conducting science experiments.

The portrayal of females as laboratory assistants is most noticeable in "Beakman's World," where either Josie or Liza help the male expert scientist, Beakman. In "Beakman's World," the lab assistant has several responsibilities. She introduces Beakman at the beginning of the program, introduces guest speakers (Beakman in disguise), reads questions for Beakman to answer, assists with scientific demonstrations, asks questions, and praises Beakman.

The lab assistant's role is part-assistant and part-cheerleader, but rarely that of principal researcher.

Like graduate lab assistants, the lab assistant's primary responsibility on "Beakman's World," is to help the principal researcher. Beakman's female assistants, however, usually are shown watching him conduct scientific experiments and asking questions throughout the experiments. For example, Josie asks in one episode, "So, if water doesn't conduct electricity, why can't I blow dry my hair in the bathtub?" In many ways, Josie asks the questions young viewers might have.

The difference in the status of the lab assistants and the principal researcher is frequently reinforced on the program. In one episode, Beakman refers to Josie as "the heir to the Beakman throne." This statement suggests that after Josie gains more experience by helping a well-established, more experienced scientist, she will have a lab of her own. In another episode, Josie refers to Beakman as her "boss."

Beakman's assistants are portrayed as teenagers, even though the actors are in their 20s. Josie and Liza are cool, energetic teens who usually appear in colorful, eclectic attire. For example, in one episode, Josie appears in a yellow t-shirt and orange vest. Colorful, dangling earrings hang underneath her curly brown hair loosely piled on top of her head and secured with a hairpin with a plastic goose on the end.

The female assistants on "Beakman's World" occasionally are shown conducting scientific demonstrations and explaining

scientific phenomena. After they are finished, Beakman often appears on the screen to reinforce and elaborate on his assistants' comments. For example, he says, "That was brilliant Liza. You see. A banana is 76 percent water. When you freeze it, it becomes 76 percent ice." Beakman also does not allow his assistants to take too much notoriety away from him. In one segment after Liza explains that the heart is a muscle that pumps blood to the cells in the body, Beakman gently moves her to the side and reclaims center stage.

Beakman often congratulates his assistants when they do good work, much like a principal researcher in a lab would. For example, in one episode, Josie explains the concept of electricity: "Because we know that anytime we put something between the two wires and the bulb lights up, that something conducts electricity. But it's got to be the right something." Beakman encouragingly replies: "Excellent Josie, give your brain a high five."

Josie and Liza are not portrayed as being as knowledgeable as Beakman. They are assistants, and still have much to learn about science. During one episode, Beakman again complements Liza and says: "Her brain's been doing pushups again." But Liza admits that she does not have all the answers and is still confused. She responds: "Maybe my brain needs more pushups, I don't get it."

Many of the female characters on "Bill Nye the Science Guy" are portrayed as laboratory assistants. For example, in the episode on chemical reactions, several 10- to 12-year-old girls dressed in fluorescent orange and yellow lab coats are clustered

around various lab stations working on experiments in Nye Labs. Unlike "Beakman's World," however, many of the male characters also are portrayed as laboratory assistants. Yet, the principal researcher, Bill Nye, is a male character.

Bill's special status as the principal researcher in the lab is often reinforced on the program. He is shown repeatedly working at the largest laboratory bench with the most elaborate equipment. In addition, the laboratory is named after him and he controls all access to the lab. In one episode, celebrity Guest Candice Cameron punches a code into the cipher lock outside of Nye Labs. She has the wrong code and must knock on the door to gain entrance. Annoyed, she says, "This wouldn't happen if it was Cameron Labs." She must wait for Nye to let her into the lab.

Females as Science Reporters

"Newton's Apple" features a female character who is portrayed as a science reporter. While Field Reporter Peggy Knapp is shown working in a science-related field, but she is not a scientist. Peggy is shown interviewing a dive specialists about the bends, reporting on the natural history of tumble weeds, and explaining how cows produce milk. She often is shown interviewing both male and female scientists and reporting on what she has learned.

Knapp is portrayed as extremely knowledge about science. Her reporting reflects her ability to understand and explain science. For example, in one episode she explains how cows produce milk. She says:

> Then the food goes into the reticulum, and bacteria and stomach acids work on the food as it passes through the

> omasum and abomasum. That way, cows eat large amounts of coarse, fibrous foods and turn it into the raw materials that make milk.

Like a good science reporter, she simplifies the technical information she obtains for her viewers.

Females as Adult Expert Scientists

Female characters are rarely portrayed as adult expert scientists on the children's educational science programs. The role of expert scientists usually is represented by male characters. Female characters are more likely to be portrayed as expert scientists on "Bill Nye the Science Guy" and "Newton's Apple," but rarely, if ever, on "Mr. Wizard's World" and "Beakman's World."

Although the image of the adult female expert scientist is rare, it did appear in a number of the programs. One of the segments on "Bill Nye the Science Guy" is called "Way Cool Scientist," which often features adult female scientists. Some of the guest adult female scientists who have appeared on this segment include an obstetrician, eye implant technician, and a naturalist.

In "Newton's Apple," one of three primary characters is an adult female scientist. Naturalist Nancy Gibson often reports on what she has learned from her research and travel. For example, in one episode she explains natural selection of the bison population. In another she shows David an arctic wolf like those she followed during the summer.

"Newton's Apple" also features adult female guest scientists who are portrayed as knowledgeable, professional, self-assured, and

competent. During one episode a female cardiologist leads Host David Heil through a model of the human heart and displays her extensive knowledgeable of physiology. For example, David asks: "OK, so, the oxygenated blood goes on the left and the blue blood on the right." The cardiologist confidently replies: "That's right. The two atrium fill at the same time and the two ventricles pump blood out at the same time, 70 beats a minute, 24 hours a day. That's nearly 2,000 gallons a day."

In another episode, a female chemist confidently explains how scientists test chili peppers for hotness using an instrument called an HPLC, High Performance Liquid Chromatography. She explains how an HPLC works: "What we do is grind up the chili peppers and make an extract of them and inject them on the system. And the system then separates the different chemical compounds in that extract and we get a peak for each one."

The adult female scientists who appear on "Newton's Apple" are portrayed realistically. They are shown dressed in ordinary attire. For example, the dive injury specialist who explains the bends wears a tweed blazer, black t-shirt, silver jewelry and gold wedding band. She is shown against equipment panels filled with monitors and dials.

In the episode of "Beakman's World," when Liza is portrayed "Dr. Liza," she also appears in attire that would be appropriate for a physician. Liza is dressed much more conservatively than usual for her character. She wears a beige lab coat; black, horn-rimmed glasses, and plain gold loop earrings, which appear

underneath a ponytail. In this segment she explains the Heimlich Maneuver to Lester and Beakman, who appears in a skeleton outfit, literally stripped of the lab coat that symbolizes his affiliation with the scientific community.

Conclusions

This analysis of female characters in children's educational science programs reveals that discouraging messages are being conveyed about the role and status of women in the scientific community. While girls and boys were equally represented on these programs, male adults appeared three times as often as female adults, and male scientists appeared twice as often as female scientists. These findings are similar to results obtained by Vande Berg and Streckfuss (1992) who reported that male characters outnumbered female characters on prime-time programming by two to one.

Although young female viewers of these programs can identify with the young female characters few adult female role models are shown on these programs, with the exception of "Newton's Apple." Providing adult female role models is important in encouraging girls to pursue scientific careers and showing them they can be successful in those careers. Ivey (1987) writes: "Career options appear more viable to someone who sees a person like herself as a science or engineering professor, in advertisements for technical industries, or on technical career-day panels" (p. 84).

In addition to underrepresenting adult females and adult female expert scientists on these programs, other attributes of

these programs reflect bias. In three out of four of these programs, the lead characters are males. Each of these lead characters is portrayed as expert scientists. Only the host of "Newton's Apple" shares the lead role with female characters. The titles of all four programs, "Mr. Wizard's World," "Bill Nye the Science Guy," "Beakman's World," and "Newton's Apple," refer to men. These titles suggest that science is a part of a man's world.

The majority of female characters on these programs are cast in secondary roles of lower status. Of the 82 female characters observed, 69 were portrayed in secondary roles as students, laboratory assistants and science writers. Noticeably few women were portrayed as expert scientists or in positions of high prestige within the scientific community. These findings are consistent with those from LaFollette's (1981) analysis of female scientists in Saturday morning children's programs that showed only four out of 12 continuing characters identified as scientists were women.

By limiting the number of women presented in positions of authority, these programs convey the inaccurate message that most women are not knowledgeable and experienced enough to run their own labs and hold high-level positions within the scientific community. Through this representation of women, children's educational science programs perpetuate the "symbolic annihilation" (Tuchman, 1981, p. 170) of women on television and in the sciences.

Television has the potential to influence children's conceptions of gender roles. As primary cultural texts in American

society, television programs play "an important role in promoting the dominant forms of femininity and masculinity at a symbolic level" (Gilbert and Taylor, 1991, p. 12). Children's educational science programs could provide more positive female role models for young female viewers to counter the misperceptions most children have that scientists are males (Fort and Varney, 1989). LaFollette (1981) explains:

> Accurate portrayals of the scientific life could help to dispel the image of eccentricity, and could help in encouraging minority students, young women, and the physically handicapped that a scientific career is possible for them. (p. 19).

By providing more adult female role models, these programs could serve an important role in encouraging women to pursue scientific careers.

The documentation of portrayals of women is only the first step. Content analyses alone cannot determine whether the underrepresentation and stereotypical presentation of women have an impact on the aspirations of young female viewers. The next step is to assess the effects of these images on young viewers in order to determine the extent to which these images influence informal learning about gender roles. Further research also needs to examine the array of factors in the social context in which children live that affect how they identify with work roles.

Table 1: Number of Male and Female Characters and Number of Male and Female Scientists for Each Program.

	Female Adults	Female Children Teens	Female Scientists*
Mr. Wizard's World	0	16	0
Beakman's World	0	6	1
Bill Nye the Science Guy	11	27	3
Newton's Apple	19	3	8
TOTAL	30	52	12

	Male Adults	Male Children & Teens	Male Scientists**
Mr. Wizard's World	12	15	6
Beakman's World	17	0	7
Bill Nye the Science Guy	23	23	7
Newton's Apple	35	9	7
TOTAL	87	47	27

	Male and Female Adults	Male and Female Children/Teens	Male and Female Scientists
TOTAL	117	99	39

* The number of female scientists is out of the total number of female characters.

** The number of male scientists is out of the total number of male characters.

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